

On the Range of Variation of the Oral Appendages in some Terrestrial Isopods. By WALTER E. COLLINGE, M.Sc., F.L.S., F.E.S.

(PLATES 20 & 21.)

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CONTENTS.

	Page
I. Introduction.....	287
II. Species Examined.....	288
1. <i>Ligia oceanica</i> , Linn.	289
2. <i>Trichoniscus roseus</i> (Koch)	289
3. <i>Oniscus asellus</i> , Linn.	289
4. <i>Porcellio scaber</i> , Latr.	290
5. <i>Porcellio levis</i> , Latr.	291
6. <i>Porcellionides pruinosus</i> (Brandt)	291
7. <i>Armadillidium vulgare</i> (Latr.)	292
III. Summary and Conclusion	292
IV. Bibliography	292

I. INTRODUCTION.

IN classifying the different Orders of animals, zoologists have endeavoured to separate species and genera from one another by certain characters which are constant for a particular genus or species; thus in Insects the form of the antennæ and the venation of the wings has been largely used, in Molluscs the generative organs and nervous system.

Many of the systems propounded by earlier writers have been discarded because the characters relied upon for this separation, have on further study, been found to vary greatly in individual species and therefore to be unreliable.

In the various attempts that have been made to classify and diagnose the different genera and species of Terrestrial Isopoda, students have laid particular stress at different times upon the shape and form of almost every part of the external structure.

Considerable reliance has of recent years been placed upon minute differences in the oral appendages, and the object of the present paper is to show that these particular appendages are liable to a large amount of variation in individual species, and are therefore characters of only minor importance as compared with the form of the head, antennæ, telson, uropoda, mesosomatic segments, and thoracic appendages.

Lereboullet (Compt. Rendus, 1849, xx. p. 346) stated that in his opinion the oral appendages are in no case available for characterizing the genera and

species, and Miers (4) was of a similar opinion. The late Dr. Budde-Lund, however, whose ripe experience and wide acquaintance with the terrestrial species of this Order made his judgment so valuable, placed the greatest reliance upon these organs (1 & 2).

Restricting my remarks to the genera occurring in the British Isles, an examination of the oral appendages shows that in most of them the form of the mandibles and 1st and 2nd maxillæ are very similar, *e. g.*, the two maxillæ in such widely separated forms as *Oniscus asellus*, Linn., *Philoscia muscorum* (Scopoli), *Cylisticus convexus* (de Geer), and *Armadillidium vulgare* (Latreille); and linking these together, we have a large series of Continental forms in the same genera, so that a perfect gradation can be shown to exist.

Whilst working upon our British species, and also those of other countries, I have noted that there is a considerable amount of variation in the oral appendages according to the age of the specimen, and further, that other variations occur, due, in all probability, to the nature of the food, environment, etc. This being so, it seemed desirable to examine a fairly large number of examples of representative species, and the results obtained considerably lessen, in my opinion, the value of these organs as characters for generic and specific distinction.

The shape of the head, antennæ, the mesosomatic segments, the telson, and uropoda I would regard as of primary value; that of the thoracic appendages as of secondary, whilst the value of the abdominal and oral appendages as diagnostic features I believe to be very much less.

I have only arrived at this opinion after examining a considerable number of specimens of a fairly representative series of species.

II. SPECIES EXAMINED.

The species examined and the number of examples and variations and the times they occurred are as follows:—

Species.	No. examined.	No. of Variations.	No. of times occurred.
1. <i>Lig a oceanica</i> , Linn.	36	4	7
2. <i>Trichoniscus roseus</i> (Koch)	48	1	9
3. <i>Oniscus asellus</i> , Linn.	112	13	39
4. <i>Porcellio scaber</i> , Latr.	88	7	22
5. „ <i>lævis</i> , Latr.	36	1	5
6. <i>Porcellionides pruinosus</i> (Brandt)	68	4	20
7. <i>Armadillidium vulgare</i> (Latr.)	51	3	8
	439	33	110

Unless otherwise stated all the variations occurred on both sides of the body.

1. *LIGIA OCEANICA*, Linn. (Pl. 20. figs. 1-4.)

Thirty-six specimens have been examined and four variations, one in each of the oral appendages, have been observed. The one in the mandibles occurred twice and on the right side of the body only in both cases, that in the first maxillæ once, and those in the second maxillæ and maxillipedes each twice. The specimens examined were collected from two localities.

The Mandibles.—The variation shown in fig. 1 occurred twice. In the curved form of the teeth, it is quite distinct from the figure given by Sars (5) and approaches most closely that given by Hewitt (3).

The 1st Maxilla.—The only variation noted was in a single specimen from St. Andrews (fig. 2) in which the setose bristles of the inner lobe were larger than usual and the short thick spines of the outer lobe reduced to two, the distal extremity of the lobe forming a knob-like process.

The 2nd Maxilla.—In two examples the terminal portion of the protopodite was thickened and the two setose bristles rather larger than usual, whilst externally the thickening is produced into a tooth-like spine (fig. 3).

The Maxillipedes.—In two examples the inner plate was found to have the spines unusually well developed in addition to the greater length of those at the extreme distal end there were present four spines just below these (fig. 4, *sp.*). The outer palp was considerably longer than usual, and further differed from the normal in the number and length of the spines (fig. 4).

2. *TRICHONISCUS ROSEUS* (Koch) Budde-Lund. (Pl. 20. fig. 5.)

Forty-eight specimens were examined of this interesting species, but only one variation was observed, which occurred in the maxillipedes of nine out of nineteen specimens collected at Hale, Cheshire. In these (fig. 5) the maxillipedes were of a much more robust type than ordinary, and characterised by three well-defined spines on the outer distal palp, whilst the inner one terminated in a spinous manner as in typical examples of *T. pusillus*, Brandt.

3. *ONISCUS ASELLUS*, Linn. (Pl. 20. figs. 6-16 ; Pl. 21. figs. 17, 18.)

The oral appendages of one hundred and twelve specimens of this species were examined and thirteen variations were observed. Of these six occurred in the mandibles, three in the first maxillæ, one in the second maxillæ, and three in the maxillipedes. The variations in the form of the mandibles would seem to be endless. The specimens examined were collected from three localities.

The Mandibles.—These are shown in figures 6-11. The first form (fig. 6) occurred in three different specimens, once on the right side and twice on the left. In the general shape this variation differs from the typical form, being produced laterally in a triangular manner. There are three stout mandibular teeth and three smaller pointed teeth partially overlapping these. The second

variation (fig. 7) occurred in four different specimens; twice it was paired and in the other two cases present on the right side only. Here the mandibular teeth appear fused (or worn down?), whilst below these there is a large, blunt, somewhat hammer-shaped process. The third variation (fig. 8) occurred five times, twice on the left side and three times paired. It is somewhat similar to the previous one (fig. 7), only the teeth are more produced and there is a large blunt spine on the outer face. The fourth variation (fig. 9) occurred in six specimens and paired in only one instance. There are two blunt mandibular teeth and a spinous process on the outer face whose base has coalesced with the lower division, forming a rounded boss. At the junction of the upper and lower processes there is a small palpiform structure bearing setose bristles. The fifth variation (fig. 10) was found twice, occurring once on the right side and once on the left. It differs from any of the others in that the upper process, which normally carries teeth, terminates in a blunt process, and the lower process, which has a notched terminal portion, arises from the inner instead of the outer side. The sixth variation (fig. 11) occurred in two examples and on both sides of the body. Here the lateral border was produced into a blunt flattened process.

The 1st Maxillæ.—Three variations were noted in these appendages (figs. 12–14); with one exception they related to the number and disposition of the spines of both lobes. In one case (fig. 14) only the outer lobe varied. In the first case (fig. 12) the outer lobe was wider than usual and had two large and two small curved spines and three shorter blunter ones, whilst the inner lobe terminated in two broad spines and two much shorter and smaller ones. In the next case (fig. 13) the spines of the outer lobe are the same in number but somewhat differently disposed, and in addition there are two short blunt spines below these on the inner side. The inner lobe terminates in a bifid manner. In the third case (fig. 14) there are six curved spines on the outer lobe and four shorter pointed ones. The inner lobe was normal.

The 2nd Maxillæ.—One variation only was observed (fig. 15), the external distal portion being produced slightly into a tooth-like projection.

The Maxillipedes.—Three variations were noted (figs. 16–18). Those indicated in figures 16 and 17 each occurred twice, and that in fig. 18 three times. That shown in fig. 17 is interesting, exhibiting, as it does, a peculiar flat top of the inner palp with three minute spines, quite distinct from any variation noted in any other species; moreover, I know of no species of Terrestrial Isopod where the palp of the maxillipedes terminates in this manner.

4. PORCELLIO SCABER, *Latr.* (Pl. 21. figs. 19–25.)

Eighty-eight specimens have been examined, and seven variations were noted. One of these occurred four times and another twice in the mandibles, three in the first maxillæ, and two in the maxillipedes.

The Mandibles.—The variation (fig. 19) shows the teeth of the mandible much more pointed than usual and a sharp curved spinous tooth arising from the inside. Four cases were observed where these features were present. Figure 20 shows a further modification where the inner spinous tooth has come to the edge and fused, whilst the true bifid internal tooth is spinous.

The 1st Maxillæ.—The peculiar variation shown in fig. 21 of the inner lobe occurred twice; it exhibits ten spines at the distal extremity instead of the tiny single spine and the two setose bristles. In a second case (fig. 22) there were four spines at the distal extremity and five smaller ones on the inner margin. A third variation observed once involved both lobes of the maxillæ, the outer lobe terminating distally in two large and one smaller spine, whilst the inner lobe terminated in a dense brush-like mass (fig. 23).

The Maxillipedes.—Two well-defined variations were met with, one (fig. 24) occurring no fewer than eight times and the other (fig. 25) four times. The first is remarkable for the great development of spines both in number and size, whilst in the other case there is a corresponding absence. In both cases the form of the outer lobe approaches that which obtains in normal examples of *Philoscia muscorum* (Scopoli) and again in *Porcellio rathkei*, Brandt.

5. PORCELLIO LEVIS, Latr. (Pl. 21. fig. 26.)

Thirty-six specimens were examined, but only one variation was found, which occurred in the 1st maxillæ. The outer lobe terminated in a large, curved spine followed by three smaller ones, then there was a distinct blank space bearing no spines, and below this five much finer spines were present (fig. 26). The inner lobe in all five cases terminated distally in four long curved spines.

6. PORCELLIONIDES PRUINOSUS (Brandt) Stebbing. (Pl. 21. figs. 27–30.)

Sixty-eight examples were examined of this cosmopolitan species and four variations noted. Three of the specimens were from Northern India, and in all of these the variation shown in fig. 28 was present.

The 1st Maxillæ.—Two well-marked variations occurred, one in two examples (fig. 27) in the spines of the outer lobe, which terminated in a large and prominent spine, with a smaller one arising from the inner side of the plate of the lobe. Below the large spine were six short spines, one below the other. In the second case (fig. 28) the variation was noted in three specimens from Northern India and in another example from the Channel Isles. Here the spines of the outer lobe were well defined, and in all cases there was the smaller spine arising from the inner side of the plate of the lobe. The distal extremity of the inner lobe in all four specimens terminated in a flat plate-like palp (fig. 28).

The 2nd Maxilla.—In eight specimens from Northern India this appendage had the form shown in figure 29, whilst in six examples obtained from different parts of the British Isles the variation took the form shown in figure 30.

7. ARMADILLIDIUM VULGARE (*Latr.*) *Milne-Edwards.* (Pl. 21. figs. 31–33.)

Fifty-one examples of this species were examined and three variations observed, viz., one in the mandibles found twice, and one in each of the maxillæ, each of which occurred three times.

The Mandibles.—A slight modification was noticed in two specimens where the teeth were shorter than usual (fig. 31).

The 1st Maxilla.—The outer lobe terminated in a strong spine, rather shorter, however, than in typical examples, and this was followed by five very short, tooth-like spines; the inner lobe terminated in a sharp, short spine on the outer side and two small blunt spines on the inner side (fig. 32).

The 2nd Maxilla. In the typical form the terminal portion externally is produced into a tooth-like piece whilst internally the terminal portion is more or less flat or plate-like. Sars's figure (5, pl. 82, fig. *m*) is an excellent one. In the variation noted in three examples, both the internal and external terminal portions were flat and rather stouter in build.

III. SUMMARY AND CONCLUSION.

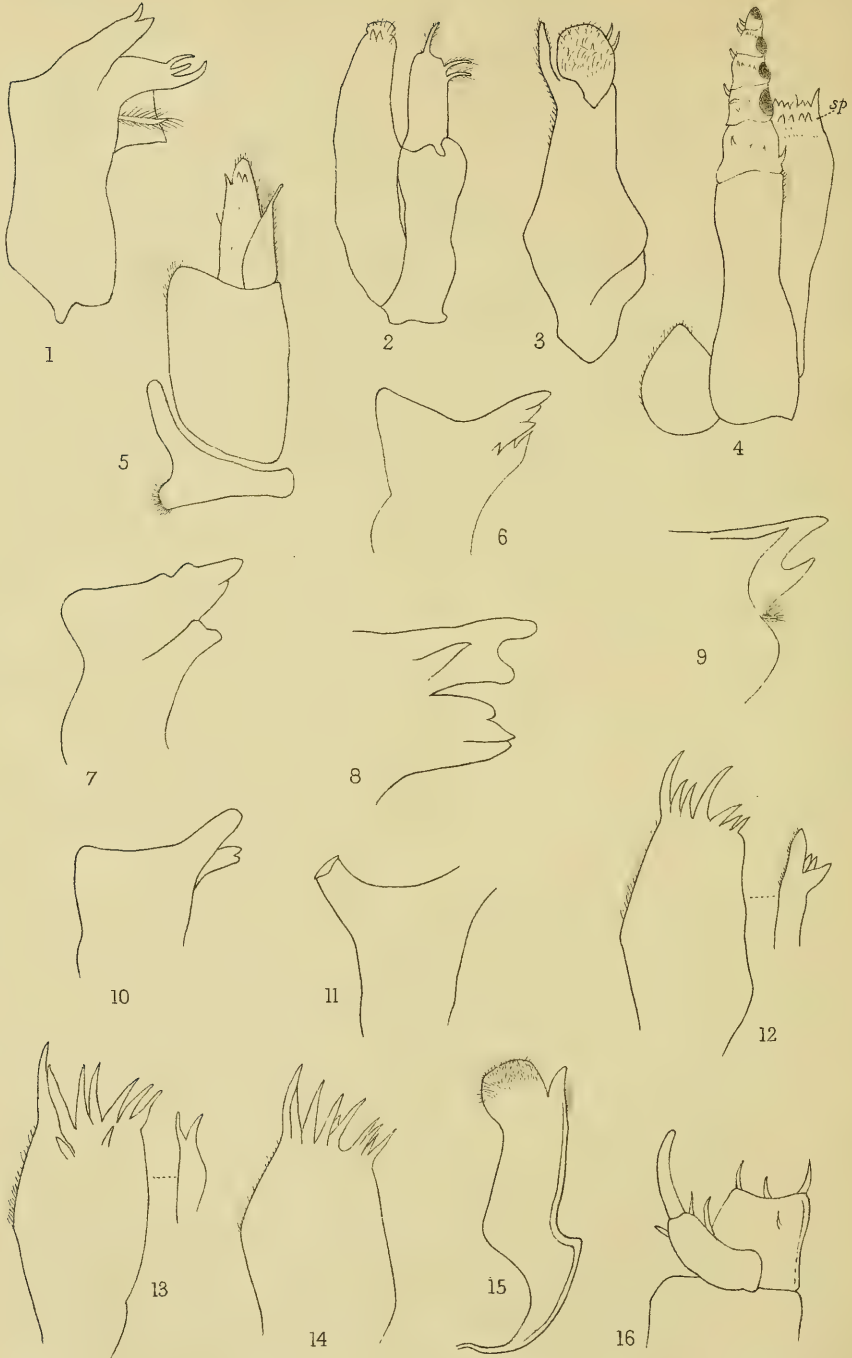
1. Four-hundred and thirty-eight specimens have been examined embracing seven species referable to six genera and four families, and one-hundred and ten individuals exhibited variations.

2. Of the one-hundred and ten individual variations thirty-one occurred in the form of the mandibles, twenty-eight in that of the 1st maxillæ, twenty-one in that of the 2nd maxillæ, and thirty in the form of the maxillipedes.

3. The conclusion arrived at, after carefully examining and considering the above mentioned variations, is, that the oral appendages are subject to a considerable amount of variation, and for purposes of specific distinction are not of the value generally supposed, and certainly not so constant as the form of the head, the mesosomatic segments, the antennæ, the telson, uropoda, and thoracic appendages. That they may serve to characterise the larger divisions is possible.

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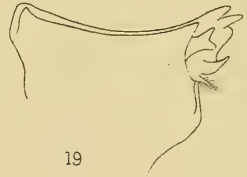
ORAL APPENDAGES OF ISOPODA.



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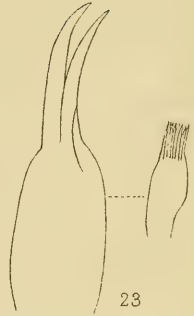
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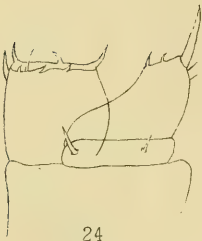
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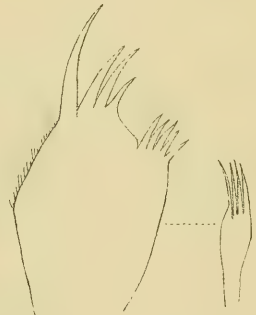
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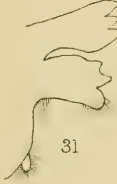
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EXPLANATION OF THE PLATES.

PLATE 20.

Fig.	1.	<i>Ligia oceanica</i> , Linn.	Mandible.
Fig.	2.	”	1st Maxilla.
Fig.	3.	”	2nd Maxilla.
Fig.	4.	”	Maxillipede.
Fig.	5.	<i>Trichoniscus roseus</i> (Koch).	Maxillipede.
Figs.	6-11.	<i>Oniscus asellus</i> , Linn.	Mandibles.
Figs.	12-14.	”	1st Maxillæ.
Fig.	15.	”	2nd Maxilla.
Fig.	16.	”	Maxillipede.

PLATE 21.

Figs.	17, 18.	<i>Oniscus asellus</i> , Linn.	Maxillipedes.
Figs.	19-20.	<i>Porcellio scaber</i> , Latr.	Mandibles.
Figs.	21-23.	”	1st Maxillæ.
Figs.	24-25.	”	Maxillipedes.
Fig.	26.	<i>Porcellio levis</i> , Latr.	1st Maxilla.
Figs.	27, 28.	<i>Porcellionides pruinosus</i> (Brandt).	1st Maxillæ.
Figs.	29, 30.	”	2nd Maxillæ.
Fig.	31.	<i>Armadillidium vulgare</i> (Latr.).	Mandible.
Fig.	32.	”	1st Maxilla.
Fig.	33.	”	2nd Maxilla.